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# A Study of Exceptional Students Who Entered The University of Kansas in the Fall of 1954

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# A Study of Exceptional Students Who Entered the University of Kansas in the Fall of 1954

DALE M. YOCUM AND KENNETH E. ANDERSON

## PART I

### Purpose of The Study

#### INTRODUCTION

Of the many issues in modern education certainly one of the most crucial is the accommodation of greatly increased and yet increasing enrollments in both public and private schools. The phenomenal acceleration of birthrate since 1940 has already produced severe congestion within the elementary school framework and is now doing the same in the high schools. It is only a matter of time until the resultant enrollment problems will be passed along to higher institutions. Unless this foreseeable course of events is countered by some large-scale disaster or revolutionary alteration in the philosophy of higher education, a crisis is imminent at the college level.

That there is such an approaching crisis is evidenced by the number of professional articles that are currently appearing, with discussion of various phases of the problem: financial, administrative, and philosophical. Illustrative of the pressure that is on the philosophy of higher education is the editorial section of a recent issue of *Phi Delta Kappan,* in which two opposing views are taken. Douglas Bush, the first writer, proposes a strict selectivity all along the line, with emphasis upon education for the elite at the college and university level. Says he, "We need to face the facts of human mentality and not twist 'democratic' into the fantastic notion that everyone is intellectually capable of a four-year college course (or even a full high-school course)."[1] The opposing writer insists that we must maintain equal opportunity for all and that we must expand higher education to keep pace with population requirements.[2]

H. B. Wells, speaking before the Eleventh Annual National Conference on Higher Education, in 1956, pointed out that our system of

[1] Douglas Bush. "The End of Education." *Phi Delta Kappan,* 38 (February, 1957) 165.

[2] Frank H. Bowles. "The Obligation of Expansion." *op. cit.* p. 166-70.

higher learning has, throughout its existence, demonstrated its ability to keep pace with the educational demands of the people. He further asserted, although some of his hearers disagreed, that even in the face of increasing enrollments, solutions to our problem can be found "within our traditional social and educational philosophy and the existing institutional framework."[3]

National enrollment in higher institutions of learning in 1900 was approximately 70,000 full-time students. By 1925 this had increased more than five times to about 400,000. Enrollment doubled between 1925 and 1940, and practically doubled again by the fall of 1955, when it reached about 1,600,000 full-time students. Assuming that there is no change in the percentage of students entering college, the increased birth rate will cause enrollment again to double by 1970.[4] It appears very certain, however, that the percentage enrollment, as well as the total enrollment, will continue to increase in line with a philosophy of maximum possible education for all, so that the situation will become even more critical than is indicated by the above figures.

As has already been intimated above, there are various aspects of this problem of accelerating enrollments. Some of the most acute are the provision of adequate facilities and faculties, the maintenance of high academic standards, guidance, placement services, financing, and adequate attention to exceptional students. It is this last phase which receives attention in the present study.

## Consideration of Exceptional Students

Considerable attention has been given in recent years to the question of mentally exceptional children, both gifted and retarded. Mildred Mills, a graduate student of Northwestern University, made an examination of *Education Index* for the years 1929 through September, 1948, to determine the number of articles dealing with the subject of gifted students at the elementary and secondary levels. She reported a total of 440 such articles, with a maximum frequency before World War II, and a decline during and after the war.[5] There has been somewhat of an increase in frequency since 1948.

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[3] H. B. Wells. "The Outlook For Higher Education in America." *Current Issues in Higher Education*. National Education Association, Washington, D.C., 1956, p. 4.

[4] *Ibid.*, p. 2.

[5] Reported by Paul Witty. "Nature and Extent of Educational Provisions for Gifted Pupils." *Educational Administration and Supervision*, 37 (February, 1951) 65-69.

The present writers have made a review of the *Education Index* from 1929 to May, 1956, to determine the listing of articles concerning exceptional students at the college level. During the same period for which Mills reported 440 articles dealing with the gifted at the elementary and secondary levels, the total reported on mentally superior college students was 39. For the same period the articles concerning mentally inferior college students numbered far less—a total of only five for the twenty-year period! The trend of frequency at the college level is similar to that of lower levels: a maximum preceding World War II, with a subsequent decline, and more recently an upturn again. From October 1948 to May 1956, there were listed 20 articles about superior students and two about inferior students at the college level.

It is entirely justifiable, considering the far greater number of students enrolled in elementary and secondary schools than in colleges, that considerably more attention has been given to the problem of mentally exceptional students at those levels. With the approaching enrollment crisis at the college level, however, it is imperative that more intense thought be given to the matter of exceptional students at that level.

In the past it has been generally assumed that the college was to serve the more gifted members of society—not exclusively, but primarily. With proper separating out of the less able all along the line, it was practically certain that few, if any, of the seriously retarded would seek college entrance. The change in philosophy of school marks, and the increasing emphasis on college education for all, however, will accentuate the problem of proper consideration of the exceptional student.

Of particular importance in reference to the theme of this study was the question posed by Smith in a recently published article.[6]

Smith presented a detailed consideration of the question as to which members of a college graduating class would have been eliminated if a "cutting score" had been established on certain placement tests. The group under study consisted of the 1006 students who received degrees at the commencement exercises of the University of Kansas in June of 1955, and for whom placement-test scores were available at the time of the investigation.

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[6] George B. Smith. "Who Would Be Eliminated? A Study of Selective Admission to College." *Kansas Studies in Education*, 7 (December, 1956). 28 pp.

Although four tests were administered to the students under investigation, only two were utilized, since they were considered to be of the type universally used in any effort to establish a selective admission policy. They were the *American Council on Education* (A.C.E.) *Psychological Examination,* 1948 College Form, and *The Cooperative English Test,* Form OM. The "cutting score" which was employed for each of the tests was the 50th percentile or median score. Certain results were given for the 25th and 75th percentiles as well.

In order to establish the representativeness of the class from which the graduates came, Smith showed that 50 per cent of entering freshmen at the University of Kansas are above, and 50 per cent below, the median on the A. C. E. Examination. Of the 1006 graduates, however, 798 were above and 208 below the national median on the A.C.E. Examination as entering freshmen. On the English test 509 were above the median and 497 below it. It is obvious that of the two tests the A.C.E. was more effective as an indicator of those who would not graduate.

There was considerable variation among the various schools of the University as to what percentage of the graduates were below the median on the two tests. For example, 87 per cent of the 20 pharmacy graduates were below the median on the English test, while 41 per cent of the 139 graduates in the College of Liberal Arts were below it. On the A.C.E. test the range of those below the median extended from 37.7 per cent for fine arts graduates down to 14.8 per cent for graduates of the School of Medicine. As Smith declared, however,

> No particular pattern of science versus humanities or music versus art or editorial versus advertising seems to be present. Students with perseverance, drive, and determination, even though they have low entrance test scores, seem to succeed in all fields of academic endeavor.[7]

As a summary of the graduates who would have been eliminated by a "cutting score," Smith said:

> . . . if a "cutting score" of the 50th percentile had been established for admission to the University of Kansas on the basis of the A.C.E. and the English placement examination alone, two examinations commonly included in every "selection" battery, that of those who actually graduated from the College of Liberal Arts & Sciences, 59 would not have been admitted; from the School of Business, 37; from the School of Education, 40; from the School of Engineering, 22; from the School of Fine Arts, 24; from the School of Journalism, 5; from the School of Law, 7; from the School of Medicine, 7; from the School of Pharmacy, 7. A total of 208 students or about 21 per cent of the graduating students of June 6, 1955, would not

[7] *Ibid.,* p.15.

have been admitted when they applied for student status at the University of Kansas.[8]

Considering the possibility of establishing a different "cutting score" on the A.C.E. test, Smith said:

> . . . if the "cutting score" for admission had been placed at the 25th percentile, 67 students would have been denied admission who in their later work did equally as well as the 140 students in the next higher quarter of test scores. Obviously more of those in the lower percentage ranges dropped out of their own free will or were invited to depart through some administrative procedure, but the 67 who continued their education did about as well as those who remained in the next 25th percentile range, at least in the opinion of many college professors who assigned the grades.[9]

Smith proceeded to investigate the evidence of scholastic honors, leadership, and advanced professional study among those graduates who were below the median of the A.C.E. Examination. It was found that 29 were on a dean's scholastic honor roll for only one semester while two were listed for as many as six semesters. A total of 46 were on the honor rolls for at least one semester.

A total of 96 offices were held by members of the group in a large number of fraternities, clubs, organized houses, and the like. Forty-nine individuals were members of 18 professional groups. There were 142 memberships held in 63 general organizations, 103 memberships in 31 clubs, and 149 memberships in 57 different fraternities and sororities.

In the fall of 1955 four of the graduates enrolled in the School of Law and four in the School of Medicine. These eight students had received only five hours of F grades among them during their undergraduate work prior to graduation.

It is evident that a real disservice would have been done had this group of below-median graduates been eliminated on the basis of the two placement-test scores. As Smith stated in conclusion:

> The loss to the state and nation would have been forty teachers, twenty-two engineers, five journalists, seven lawyers, seven doctors, seven pharmacists, and ninety-six graduates from the College of Liberal Arts and Sciences and the School of Business who majored in areas where the supply of trained manpower is in equally short supply.[10]

## General Statement of Purpose

The present study has been an effort to determine, for the exceptional students out of a particular group of college freshmen, the rela-

[8] *Ibid.*, p. 19.
[9] *Ibid.*
[10] *Ibid.*, p. 28.

tionships between certain variables which were secured at or shortly after the time of enrollment and measures of success determined during the first two years of college.

The group under consideration consisted of 1,210 freshmen who entered the University of Kansas in the fall of 1954. Eight separate scores on the placement examinations administered to the group were secured for each student. These data were supplemented by information secured through a questionnaire completed by each student during the first semester of enrollment. The pertinent factors for this study which were taken from the questionnaire were the degree of parental education, sex of the student, and the size of high school from which the student was graduated.

## Definition of Exceptional Child

Before proceeding farther it is well to arrive at a functional definition of the term "exceptional student." The National Society for the Study of Education has defined exceptional children as "those who deviate from what is supposed to be average in physical, mental, emotional, or social characteristics to such an extent that they require special educational services in order to develop to their maximum capacity."[11] Good's *Dictionary of Education* defines the atypical child as one "who deviates markedly above or below the norm of his group in respect to one or several mental, physical, or social traits, or any combination of these, so as to create a special problem in regard to his education, development, or behavior."[12] Heck has defined the exceptional child as "one that varies from the normal by a considerable amount in any one of a number of traits."[13] It will be noted that in none of the foregoing definitions is there any effort made to delimit precisely the range of the exceptional child in terms of such quantitative measures as I.Q. or test scores. The exceptional child is considered rather in terms of deviation from the average of the group of which he is a part.

Although the reader may quarrel with the term exceptional as used in this study, the exceptional student was considered as one who fell within either the upper or lower 10 per cent of the score distributions

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[11] Yearbook Committee, National Society for the Study of Education. *The Education of Exceptional Children, Forty-Ninth Yearbook, Part II.* University of Chicago Press, Chicago, 1950, p. 3.

[12] Carter V. Good. *Dictionary of Education.* McGraw Hill Book Co., New York, 1945, p. 67.

[13] Arch O. Heck. *The Education of the Exceptional Child.* McGraw Hill Book Co., New York, 1953, p. 2.

on any one of the placement tests, or of the grade-point distributions for each of the first four semesters.

There are two noteworthy consequences of this usage of the term: (1) It is not accurate to think of the lowest 10 per cent group as being mentally inferior in terms of I.Q. or in comparison with the general population. It is conceivable that they were above the average intelligence of those of their own age, and yet fell within the lowest 10 per cent on a college placement test. (2) Exceptional groups were determined separately for each of the placement tests as well as for the grade-point averages accumulated over two years, or four semesters. A considerable amount of overlapping was expected among the various groups, the degree of which is revealed in the findings which follow later.

### Specific Statement of Purpose

Specifically, the purpose of this study may be stated in terms of five problems.

1. To discover the relationships between the eight abilities or aptitudes, as measured by the placement examinations, and success or failure in college, as measured by the grade-point averages for the first four semesters.

2. To discover the relationship between a measure of parental education and success or failure, as indicated by the grade-point averages for the first four semesters.

3. To discover the relative contribution of the two sexes to the exceptional ability groups, as revealed by the placement-test scores, and to the exceptional achievement groups, as shown by the grade-point averages for the first four semesters.

4. To discover the relationship between size of high school and achievement, as indicated by the grade-point averages for the first four semesters.

5. To discover the variability in achievement, as measured by the grade-point averages for the first four semesters, of the exceptional-ability groups, as determined by the placement-test scores.

### Summary

The pressing need for adequate attention to the exceptional student at the college level is being increasingly stressed as enrollments swell.

Whereas much is being said, little of tangible value is being done about the problem. It was the objective of this study to investigate certain features of the exceptional college freshman and to see how these were related to achievement during the first four semesters of attendance with the purpose of raising questions rather than recommending methods as to how to handle the exceptional student in the University or to determine who should or who should not be admitted.

## PART II

## Sources of Data

### Introduction

The present investigation[14] is one phase of a comprehensive, longitudinal study[15] of the class which entered the University of Kansas in the fall of 1954. The scope of the study is to include investigations into such problems as: (1) the factors leading to success in college, (2) causes and follow-up of drop-outs, (3) extracurricular activities, (4) relationships between placement-test scores and grade-point averages during four years of college work, and (5) follow-up of graduates. Subsequent to the time of enrollment of these students considerable detailed information has been acquired in addition to that which is routinely secured from entering students. The present study is based to a considerable extent upon such supplementary information.

### Selection of the Study Group

A total of 1242 freshmen entered the University of Kansas in the fall of 1954. Because of faulty or incomplete information 32 individuals were excluded, leaving a total of 1210. Since the study involved the upper and lower 10 per cents of those individuals in the frequency distributions of the various tests, there were 121 individuals in each of the exceptional groups.

As was pointed out in Part I, it is not to be concluded that only 121 individuals were treated as being exceptionally low while another 121

[14] Dale M. Yocum. Unpublished dissertation submitted to the Department of Education and to the Faculty of the Graduate School of the University of Kansas in partial fulfillment of the requirements for the degree of Doctor of Education. September, 1957.

[15] Kenneth E. Anderson. University of Kansas: General Research Project, Number 3248-5038.

were considered as being exceptionally high. Rather, for each placement test independent groups of exceptional individuals were determined with 121 in each group. If the same individuals were involved in the lowest 10 per cent of all test-score distributions, a total of 121 only would, of course, be so involved. The same would be true for the highest ten per cent. Actually, a total of 362 different individuals were involved in the bottom 10 per cent, whereas 410 were involved in the top 10 per cent of the various measures.

## Examinations Used in the Study

A battery of four placement examinations has been employed for a number of years at the University. They were administered to the entering class in the fall of 1954 and the scores were used for a substantial portion of this study.

The names of the tests, with the separate sets of scores, were as follows:

1. *American Council on Education Psychological Examination,* Quantitative, Linguistic, and Total scores. The examination is designed especially for college freshmen and is recommended as a device for appraising general intelligence.

2. *Mathematics Test for Entering Students, University of Kansas.* The examination has a single score, but has parts devoted to testing ability in arithmetic, geometry, and algebra separately.

3. American Council on Education: *Cooperative English Test, Test C2: Reading Comprehension,* Vocabulary and Speed scores. A third score for comprehension was not employed, since it is not scored in the University testing program.

4. Educational Testing Service: *Cooperative English Test,* Usage and Spelling scores. A third score, for vocabulary, was not used, since one vocabulary score was already available.

For easy reference, the eight sets of scores were abbreviated, respectively, as A.C.E.-Q, A.C.E.-L, A.C.E.-T, K.U.-M, C.R.T.-V, C.R.T.-S, C.E.T.-U, and C.E.T.-S.

## The Questionnaire

The Bureau of Educational Research and Service prepared a questionnaire[16] to be used for the general research project of which this study is a part. It was administered to all freshmen during the fall

[16] Bureau of Educational Research and Service. "Questionnaire for All Freshmen at the University of Kansas, Fall Semester 1954." Unpublished. University of Kansas, 1954. 4 pp.

semester of 1954. Thirty-seven items were to receive coded answers, while two additional questions were to be answered in the student's own words.

Something of the general purpose of the questionnaire is contained in the following paragraph:

> The present study does *not* aim at giving the individual student who answers the questionnaire any personal guidance or advice. The reason is that it has been found in numerous other studies of related character that a student who knows or anticipates that what he writes on a questionnaire can or will be taken as a reason for action against him will not answer the questions honestly or correctly. Therefore, we have decided *not* to use any information from you personally as a reason for contacting you or giving the information to any officer of the University. The collected data will be presented in terms of correlations and group characteristics. This kind of information will be of great value for the guidance of policies of several important offices of the University.[17]

The design of this study required that information from only four items of the questionnaire be used. The questions, accompanied by the coded scale of possible answers, are as follows:

9. What is your sex?
   1—Male
   2—Female
15. What is (or was) the formal education of your father or guardian?
   1—Did not attend school
   2—Did some grade school work
   3—Finished grade school
   4—Did some high school work
   5—Graduated from high school
   6—Did some college work
   7—Received a college degree
   8—Received more than one college degree
16. What is (or was) the formal education of your mother or guardian? (Use the same code as in 15.)
18. How many students were there in the entire high school from which you graduated?
   1—1-50
   2—51-100
   3—101-300
   4—301-500
   5—More than 500

[17] *Ibid.*, p. 1.

## Grade-Point Averages

The academic achievement of students in this study was measured in terms of grade-point averages for the first four semesters or two years of enrollment. That is, the grade-point averages were calculated on the basis of grades submitted in January and in June of the years 1955 and 1956. In the event that an individual dropped out for one or two semesters and returned, information was counted as missing for the semesters of non-enrollment, and he was counted with the original group upon return.

A special method of computing grade points was devised for purposes of the research project in order to facilitate ease of calculation. The customary method employed at the University of Kansas and the special method designed for the project are shown in Table 1.

Table 1
*Grade Points Assigned to Various Letter Grades at the University of Kansas*

| Letter Grade | Customary Method | Special Project Method |
|---|---|---|
| A | 3 | 4 |
| B | 2 | 3 |
| C | 1 | 2 |
| D | 0 | 1 |
| F | —1 | 0 |

In calculating grade-point averages for any given semester, each individual's course-credit hours were multiplied by the number of grade points for the grade earned in each course, and the sum thus derived was divided by the total number of hours of course credit carried during the semester. For example, assume that an individual carried five courses with credits as shown in the diagram below. The grade-

| Course Number | Hours Credit Per Course | Course Grade | Points Per Hour | Points Per Course |
|---|---|---|---|---|
| 1 | 3 | B | 3 | 9 |
| 2 | 2 | C | 2 | 4 |
| 3 | 5 | C | 2 | 10 |
| 4 | 3 | F | 0 | 0 |
| 5 | 2 | D | 1 | 2 |
| Total .. | 15 | .. | .. | 25 |

point average was derived by dividing the total grade points by the total hours credit. Thus,

$$G.P.A. = 25/15 = 1.67.$$

Exceptional groups in academic achievement were determined in essentially the same way that they were in ability or aptitude, as shown by the placement-test scores. The uppermost and lowermost 10 per cent groups were selected for each semester. One major difference with respect to achievement was in the fact that, since there were numerous drop-outs, the number in each exceptional group decreased from each semester to the next succeeding one. Table 2 shows the number of students involved, including the total after allowance was made for duplicates, i.e., those in more than one group.

## Summary

Out of a total of 1242 freshmen who entered the University of Kansas in the fall of 1954, 1210 had sufficiently complete placement-

Table 2

*Number of Students Involved in Exceptional-Achievement Groups*

| Group | 1st Semester | 2nd Semester | 3rd Semester | 4th Semester | Total (No Duplicates) |
|---|---|---|---|---|---|
| Bottom 10% | 121 | 115 | 89 | 83 | 323 |
| Top 10% | 121 | 115 | 89 | 83 | 216 |
| Total | 242 | 230 | 178 | 165 | 539 |

test scores so that they could be used in this study. Consequently, 121 individuals were included in the upper and lower 10 per cent groups for each of the tests, making a total of 242 individuals for each test.

Eight separate test scores for each individual were secured, as follows: *American Council on Education Psychological Examination,* Q, L, and T scores; *K.U. Mathematics Test; Cooperative Reading Test,* vocabulary and speed scores; and *Cooperative English Test,* usage and spelling scores.

Additional information relative to the sex of the student, level of parental education, and size of high school from which the student came was secured by means of a questionnaire administered during the first semester.

Grade-point averages were obtained for each of the individuals involved for each of the first four semesters. Because of drop-outs the size of the exceptional-achievement groups decreased from semester to semester.

## PART III

### Analysis of the Data

#### Preliminary Treatment of Placement-Test Scores

The placement-test scores of the 1210 freshmen under consideration were arranged into eight frequency distributions, one for each set of scores. As a means of determining the membership in each exceptional group it was necessary to find the 10th and 90th percentiles for each distribution. These values are commonly referred to as $P_{10}$ and $P_{90}$.

Since $P_{10}$ and $P_{90}$ were usually fractional values, and since the scores were always whole numbers, it was generally necessary either to select a few scores slightly nearer the median, or to reject a few values slightly farther from it. Since the raw score chosen for $P_{10}$ or $P_{90}$ was one of a number of scores having the same value, it was necessary to select at random a certain number of these scores to obtain 121 for each of the groups. Table 3 shows, for each of the placement tests, the range of scores and the raw scores used for $P_{10}$ and $P_{90}$.

Table 3

*Statistical Information Pertaining to the Scores of the 1210 Freshmen in the Eight Areas Tested*

| Tests* | Range of Scores | $P_{10}$ Raw Score | $P_{90}$ Raw Score |
|---|---|---|---|
| A.C.E.—Q | 10-78 | 32 | 59 |
| A.C.E.—L | 13-110 | 47 | 85 |
| A.C.E.—T | 31-179 | 82 | 139 |
| K.U.—M | 8-75 | 31 | 67 |
| C.R.T.—V | 1-59 | 16 | 46 |
| C.R.T.—S | 0-82 | 11 | 48 |
| C.E.T.—U | 13-193 | 56 | 132 |
| C.E.T.—S | 0-49 | 5 | 32 |

*Abbreviations refer to the eight separate tests in the same order that they were listed on page 9.

## Relationships between Placement-Test Scores and Grade-Point Averages

The first problem of this study, as stated in Part I, was to discover the relationships between the eight abilities or aptitudes, as measured by the placement examinations, and success or failure in college, as measured by the grade-point averages for the first four semesters.

It was not possible to assume normality of score distributions within the exceptional groups, since each group was simply an extreme portion of the entire class, which was itself essentially normally distributed in the various areas tested. In other words, distributions for the bottom 10 per cent groups were always negatively skewed, whereas those for the top 10 per cent groups were always positively skewed.

Since distributions were not normal, the contingency coefficient was chosen to express relationships, where the correlation coefficient would otherwise have been calculated. Furthermore, the values obtained for the contingency coefficients in this study tended to be lower than those which would have been obtained had the entire freshman class been used due to the restriction of range of scores.

Table 4 contains the 64 C-values, the respective Chi-square values, and a designation of those values which were significant. The designation "B" and "T" following the various tests, refer, respectively, to the bottom and top 10 per cent groups. "GPA-1," "GPA-2," "GPA-3," and "GPA-4" refer to the grade-point averages for the first four semesters, respectively. There were 16 degrees of freedom in all cases except CET-S, bottom group, for which there were 25 degrees of freedom. In this case it was more convenient to use a 6x6-fold table.

All significant relationships were positive; i.e., as test scores increased, grade-point averages also increased.

In some instances, the contingency tables used to obtain the values in Table 4 had expected frequencies less than five in some of the cells. According to prevailing practice, Chi-square should not be employed whenever the expected frequency in any cell of a contingency table falls below five. Thus, in the present study it was decided that all coefficients in Table 4 for which the probability levels were .30 or less should be recalculated. It was felt that, for coefficients with higher probabilities than this, no significance would be added to the results by the alternative method in which no cell had an expected frequency less than five. Consequently, only these values were recalculated. The new values are shown in Table 5.

TABLE 4

*Statistical Relationships between Placement Test-Scores and Grade-Point Average for Exceptional Students*

| Exceptional Group | | G.P.A.—1 | | G.P.A.—2 | | G.P.A.—3 | | G.P.A.—4 | |
|---|---|---|---|---|---|---|---|---|---|
| | | C | Chi-square | C | Chi-square | C | Chi-square | C | Chi-square |
| A.C.E.—Q | B | .40 | 24.31 | .37 | 16.54 | .34 | 7.27 | .49 | 17.10 |
| A.C.E.—Q | T | .40 | 23.12 | .30 | 11.30 | .31 | 11.46 | .36 | 15.43 |
| A.C.E.—L | B | .48 | 35.96** | .38 | 16.81 | .50 | 16.06 | .54 | 17.16 |
| A.C.E.—L | T | .35 | 16.80 | .38 | 19.79 | .44 | 25.16 | .37 | 16.31 |
| A.C.E.—T | B | .43 | 27.92* | .44 | 23.66 | .54 | 19.55 | .44 | 10.41 |
| A.C.E.—T | T | .44 | 29.18* | .35 | 16.84 | .40 | 20.52 | .39 | 19.30 |
| K.U.—M | B | .35 | 16.38 | .47 | 28.17* | .53 | 16.53 | .43 | 9.09 |
| K.U.—M | T | .35 | 16.80 | .34 | 16.00 | .31 | 11.79 | .37 | 17.42 |
| C.R.T.—V | B | .44 | 29.46* | .45 | 25.01 | .45 | 15.41 | .51 | 18.36 |
| C.R.T.—V | T | .39 | 21.96 | .32 | 13.06 | .32 | 12.48 | .40 | 18.90 |
| C.R.T.—S | B | .37 | 18.80 | .48 | 30.16* | .52 | 21.10 | .38 | 8.78 |
| C.R.T.—S | T | .46 | 32.94** | .37 | 18.99 | .31 | 10.69 | .31 | 10.73 |
| C.E.T.—U | B | .34 | 16.03 | .45 | 24.80 | .49 | 15.66 | .52 | 16.08 |
| C.E.T.—U | T | .39 | 21.22 | .39 | 20.36 | .33 | 12.61 | .30 | 9.70 |
| C.E.T.—S | B | .30 | 11.73 | .44 | 25.68 | .52 | 26.09 | .51 | 22.32 |
| C.E.T.—S | T | .34 | 15.68 | .40 | 22.72 | .39 | 17.23 | .39 | 16.40 |

* Significant at the five per cent level.
** Significant at the one per cent level.
All significant relationships are positive.

TABLE 5

*Supplementary Information Concerning Statistical Relationships between Placement-Test Scores and Grade-Point Averages*

| Group | | G.P.A.—1 | | | | G.P.A.—2 | | | | G.P.A.—3 | | | | G.P.A.—4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | C | Chi-square | Method | d.f. | C | Chi-square | Method | d.f. | C | Chi-square | Method | d.f. | C | Chi-square | Method | d.f. |
| A.C.E.—Q | B | .26 | 8.76 | 2 | 6 | | | | | | | | | | | | |
| A.C.E.—Q | T | .28 | 10.05 | 2 | 6 | | | | | | | | | | | | |
| A.C.E.—L | B | .44 | 29.29** | 2 | 6 | | | | | | | | | | | | |
| A.C.E.—L | T | .32 | 13.33* | 2 | 6 | .35 | 16.02* | 2 | 6 | .41 | 21.44** | 2 | 4 | .30 | 9.98* | 2 | 4 |
| A.C.E.—T | B | .38 | 21.02** | 2 | 6 | .32 | 11.42 | 2 | 6 | .10 | .52 | 2 | 2 | | | | |
| A.C.E.—T | T | .33 | 11.78* | 1 | 4 | .45 | 22.49** | 1 | 4 | .28 | 6.52 | 1 | 4 | .32 | 10.46* | 1 | 4 |
| K.U.—M | B | | | | | .25 | 6.79 | 2 | 6 | | | | | | | | |
| K.U.—M | T | | | | | | | | | | | | | | | | |
| C.R.T.—V | B | .22 | 6.13 | 2 | 6 | .29 | 9.38 | 1 | 6 | | | | | | | | |
| C.R.T.—V | T | .25 | 6.82 | 1 | 4 | | | | | | | | | .36 | 10.81* | 1 | 4 |
| C.R.T.—S | B | .20 | 3.32 | 1 | 6 | .28 | 5.12 | 1 | 4 | .23 | 3.08 | 2 | 3 | | | | |
| C.R.T.—S | T | .14 | 1.80 | 1 | 4 | .23 | 5.07 | 1 | 4 | | | | | | | | |
| C.E.T.—U | B | .27 | 8.57 | 1 | 6 | .32 | 10.72 | 2 | 6 | | | | | | | | |
| C.E.T.—U | T | .33 | 12.07** | 1 | 3 | .26 | 7.36* | 1 | 2 | | | | | | | | |
| C.E.T.—S | B | | | | | | | | | | | | | | | | |
| C.E.T.—S | T | | | | | .16 | 2.91 | 2 | 4 | | | | | | | | |

* Significant at the five per cent level.
** Significant at the one per cent level.
Method 1: Chi-square calculated by eliminating squares with expected frequency less than five.
Method 2: Chi-square calculated by combining marginal rows and columns to give expected frequencies of five or greater.
All significant relationships are positive.

Among the eight sets of placement-test scores only four had any significant relation to grade-point averages for any of the four semesters. These were, in order of the frequency of significant coefficients, *A.C.E. Psychological Examination,* linguistic score, five; *A.C.E. Psychological Examination,* total score, four; *Cooperative English Test,* usage score, two; and *Cooperative Reading Test,* vocabulary score, one. It was noteworthy that all of the foregoing were tests of the use of language, or at least were influenced strongly thereby; neither the quantitative portion of the *A.C.E.* test nor the *K.U. Mathematics Test*—both involving emphasis on the use of numbers—showed any significant relation to college grades. The latter statement probably would not be true in curricula such as engineering, dependent on a sound foundation in mathematics.

Of the 12 significant coefficients in Table 5, 10 were for the top ten per cent groups, and only two for the bottom exceptional groups. This indicates that if any effort were made to predict grade-point averages, at least so far as placement-test scores are concerned, the predictions would be more reliable for the superior, than for the inferior, students. If the purpose were to predict grade-point averages from placement-test scores, the entire group of students in the freshman class would be used and not just the upper or lower ten per cent groups.

In summary it may be said, concerning the relationships between placement-test scores and grade-point averages, that, in general, they (a) decreased from one semester to the next, (b) were more significant for the top 10 per cent groups than for the bottom ones, and (c) were significant for only certain tests which involved the use of language, and for no tests which involved the use of mathematics.

## The Relation of Parental Education to Success or Failure in College

The second problem was to discover the relationships which existed between the level of parental education and success or failure in college, as measured by the grade-point averages for the first four semesters.

The relationships were calculated in terms of the contingency coefficient, for the same reason as in the preceding problem, i.e., non-normality of distributions. As was shown in Part II, information concerning the level of education of both parents was provided by each student in coded answers to questions on the questionnaire. There were eight possible levels from which to choose for each parent.

Contingency tables were prepared to relate the education of each parent to each semester-grade-point average for both bottom and top groups. This yielded a total of 16 such tables and a like number of coefficients. The results appear in Table 6. All coefficients were found

TABLE 6

*Statistical Relationships between Levels of Parental Education and Grade-Point Averages for Exceptional Students*

| GPA for Semester | Exceptional Group | Levels of Fathers' Education | | | Levels of Mothers' Education | | |
|---|---|---|---|---|---|---|---|
| | | C | Chi-square | d.f. | C | Chi-square | d.f. |
| 1 | Bottom 10% | .40 | 23.35** | 3 | .23 | 6.64 | 3 |
| 1 | Top 10% | .27 | 9.52** | 2 | .05 | .29 | 2 |
| 2 | Bottom 10% | .32 | 13.41* | 6 | .22 | 6.10 | 6 |
| 2 | Top 10% | .36 | 16.68** | 4 | .12 | 1.55 | 2 |
| 3 | Bottom 10% | .13 | 1.45 | 4 | .14 | 1.68 | 4 |
| 3 | Top 10% | .17 | 2.49 | 2 | .11 | 1.18 | 2 |
| 4 | Bottom 10% | .12 | 1.26 | 4 | .12 | 1.13 | 3 |
| 4 | Top 10% | .00 | .00 | 2 | .06 | .27 | 2 |

* Significant at the five per cent level.
** Significant at the one per cent level. All significant relationships are positive.

by combining rows and columns rather than by eliminating them, to give the minimum expected frequencies. "GPA" denotes grade-point average, and "d.f." refers to degrees of freedom. The table is to be read as follows: for the bottom 10 per cent group in grade-point averages for the first semester the contingency coefficient relating GPA-1 and fathers' education was .40; the Chi-square value was 23.35; and with three degrees of freedom such a value had less than one chance in 100 of occurring by chance alone. In other words, the Chi-square value was significant at the one per cent level. Other values were interpreted in the same way. It will be observed that all of the significant relationships were within the scope of the first two semesters.

The contingency values for each exceptional group decreased progressively from semester to semester, with the exception of an increase from the first semester to the second for the top-achievement group, and for the educational levels of both parents. There were no significant values relating the level of mothers' education to achievement for either exceptional group. Therefore, the level of education of the fathers was more closely related to achievement within both exceptional groups than was the level of the mothers' education. Even considering the fathers' education, though, there was no significance beyond the first two semesters.

It might be argued that the explanation for the lack of relationship between fathers' education and achievement beyond the first two semesters lay in the fact that a progressive selectivity from semester to semester reduced the variability in the level of fathers' education. If this were true it would perhaps be fallacious to conclude from Table 6 that the relationship decreased after the second semester, because a reduced variability of the level of fathers' education within exceptional groups would, in itself, occasion a decrease in relationships.

In order that the above argument might be examined, Table 7 was prepared. It contains, for each exceptional-achievement group, the

TABLE 7

*Percentages of Students in Exceptional-Achievement Groups whose Fathers Attained Specified Levels of Education*

| Coded Level of Fathers' Education | Percentages by Semester | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1st Sem. (N-121) | | 2nd Sem. (N-115) | | 3rd Sem. (N-89) | | 4th Sem. (N-83) | |
| | B* | T | B | T* | B | T* | B | T |
| 1 | .83 | .00 | .87 | .00 | .00 | .00 | .00 | .00 |
| 2 | 4.17 | .00 | .87 | .88 | 6.74 | .00 | 8.43 | .00 |
| 3 | 5.83 | 10.74 | 6.96 | 10.52 | 8.99 | 3.41 | 10.85 | 4.82 |
| 4 | 18.33 | 4.96 | 17.39 | 5.26 | 12.36 | 4.54 | 10.85 | 9.64 |
| 5 | 23.32 | 22.30 | 25.22 | 27.18 | 29.22 | 24.99 | 28.92 | 24.10 |
| 6 | 31.65 | 18.17 | 29.57 | 17.54 | 23.60 | 15.90 | 19.28 | 14.46 |
| 7 | 6.66 | 31.39 | 12.17 | 25.43 | 11.24 | 32.94 | 13.26 | 32.53 |
| 8 | 9.16 | 12.39 | 6.96 | 13.16 | 7.87 | 18.18 | 8.44 | 14.46 |

* Data missing from one questionnaire.

percentage of students who had fathers of each coded level of education. Mothers were not included because there were no significant relationships involving their levels of education. The data reveal no trend toward a reduction of variability from one semester to the next.

Returning to Table 6, it appeared that among the contingency values in general there was no advantage in favor of either exceptional group. Where the values were significant, there was a slight advantage in favor of the top 10 per cent group. Within the bottom 10 per cent group there were two significant coefficients, one at the five per cent level and the other at the one per cent level. Within the top 10 per cent group there were also two significant coefficients, but both were at the one per cent level.

The findings may be summarized as follows:

1. The only significant relationships between the level of parental education and college achievement involved the education of the fathers.

2. There were significant relationships between the level of the fathers' education and college achievement for both exceptional groups for the first two semesters, but none thereafter.

3. There appeared to be no special advantage in favor of either exceptional group with respect to the relationships between the level of parental education and achievement in college.

## Relative Contribution of the Sexes to Ability and Achievement Groups

The third problem to be attacked was that of finding the relative contribution of the sexes to ability, as revealed by placement-test scores, and achievement, as shown by grade-point averages. This involved, in reality, two separate sub-problems.

### Sex and Placement-Test Scores

Table 8 presents, for each of the 16 exceptional-ability groups, the number of each sex, the percentage of the entire freshman total of each sex, the X-value, and an indication of the significance of the difference between percentages. A minus value of X indicates that the percentage of men is greater, whereas a plus value indicates a greater percentage of women.

Inspection of the results reveals that, out of a total of 16 comparisons, 10 differences were significant—two at the five per cent level and eight at the one per cent level. Of the 10 significant differences, six were for the top 10 per cent groups and four for the bottom groups, indicating that differences were more outstanding within the groups of superior ability.

There were two sets of scores—the CET-Usage and CET-Spelling—in the top 10 per cent of which there was a significantly greater percentage of women, and in the bottom 10 per cent of which there was a significantly smaller percentage of women. In two additional sets of scores—the ACE-Linguistic and CRT-Vocabulary—there were significantly more women, by percentage, in the top 10 per cent groups, but not significantly less in the bottom 10 per cent groups. These comparisons all indicate the superior ability of the women.

TABLE 8
*The Relative Contributions of the Sexes to Exceptional-Ability Groups*

| Set of Scores | Exceptional Group | Men in Group: No. of Men | Men in Group: Percentage of all Men† | Women in Group: No. of Women | Women in Group: Percentage of all Women‡ | X |
|---|---|---|---|---|---|---|
| A.C.E.—Q | B | 59 | 8.27 | 62 | 12.47 | +2.40* |
| A.C.E.—Q | T | 95 | 13.32 | 26 | 5.23 | −4.62** |
| A.C.E.—L | B | 66 | 9.26 | 55 | 11.07 | +1.03 |
| A.C.E.—L | T | 53 | 7.43 | 68 | 13.68 | +3.57** |
| A.C.E.—T | B | 66 | 9.68 | 55 | 11.07 | +1.03 |
| A.C.E.—T | T | 69 | 9.26 | 52 | 10.46 | +0.45 |
| K.U.—M | B | 44 | 6.17 | 77 | 15.49 | +5.33** |
| K.U.—M | T | 108 | 15.15 | 13 | 2.62 | −7.16** |
| C.R.T.—V | B | 73 | 10.24 | 48 | 9.66 | −0.33 |
| C.R.T.—V | T | 61 | 8.56 | 60 | 12.07 | +2.01* |
| C.R.T.—S | B | 76 | 10.66 | 45 | 9.05 | −0.92 |
| C.R.T.—S | T | 65 | 9.12 | 56 | 11.27 | +1.23 |
| C.E.T.—U | B | 101 | 14.17 | 20 | 4.02 | −5.80** |
| C.E.T.—U | T | 40 | 5.61 | 81 | 16.30 | +6.11** |
| C.E.T.—S | B | 94 | 13.18 | 27 | 5.43 | −4.43** |
| C.E.T.—S | T | 49 | 6.87 | 72 | 14.49 | +4.35** |

† Total number of freshman men: 713.
‡ Total number of freshman women: 497.
* Significant at the five per cent level.
** Significant at the one per cent level.
— Difference is in favor of men.
+ Difference is in favor of women.

On the other hand, there were two sets of scores—the A.C.E.-Quantitative and K.U.-Mathematics—which revealed a significantly greater percentage of men in the top 10 per cent groups and a significantly smaller percentage of men in the bottom 10 per cent groups. These comparisons pointed to the superior ability of the men.

The above findings may be summarized in the statement that women students manifested superior ability in English usage and spelling and, to a lesser extent, in linguistics and vocabulary, whereas the men evidenced superiority in mathematics and quantitative thinking. It should be pointed out that the ratio of women to men in the class was 1.00 to 1.43.

### SEX AND ACADEMIC ACHIEVEMENT

The next phase of the third problem was to find the relative contribution of the sexes to the exceptional-achievement groups as estab-

lished by the grade-point averages for the first four semesters. The same method was used as was employed in the foregoing section, i.e., the calculation of the difference between two percentages.

Table 9 presents, for each of the exceptional-achievement groups, the number of each sex, the percentage of the entire freshman total of

TABLE 9
*The Relative Contributions of the Sexes to Exceptional-Achievement Groups*

| | | Men in Ach. Group | | Women in Ach. Group | | |
|---|---|---|---|---|---|---|
| Semester | Group | No. of Men | Percentage of all Men | No. of Women | Percentage of all Women | X |
| 1 | B | 76 | 10.66 | 45 | 9.05 | − .92 |
| 1 | T | 69 | 9.68 | 52 | 10.46 | + .45 |
| 1 | Total | 713 | | 497 | | |
| 2 | B | 84 | 12.63 | 32 | 6.99 | −3.05** |
| 2 | T | 60 | 9.02 | 56 | 12.23 | 1.74 |
| 2 | Total | 665 | | 458 | | |
| 3 | B | 81 | 15.28 | 8 | 2.39 | −6.08** |
| 3 | T | 44 | 8.30 | 45 | 13.43 | +2.42* |
| 3 | Total | 530 | | 335 | | |
| 4 | B | 70 | 14.17 | 13 | 4.14 | −4.58** |
| 4 | T | 46 | 9.31 | 37 | 11.78 | +1.13 |
| 4 | Total | 494 | | 314 | | |

* Significant at the five per cent level.
** Significant at the one per cent level.

each sex, the X-value, and an indication of the significance of the difference between percentages. In addition, the total of men and women in the group under study was included, since it was different each semester. The signs attached to the X-values are to be interpreted as before. In the designation of exceptional groups "B" and "T" refer, respectively, to the bottom and top 10 per cents.

The table is to be read as follows: during the first semester there were 713 men and 497 women in the entire group under study, out of which number 76 men and 45 women were in the low-achievement group, and 69 men and 52 women were in the high-achievement group. Changing these figures to percentages, 10.66 per cent of all men and 9.05 per cent of all women were in the bottom 10 per cent group. In comparing the two percentages it is found that the X-value is —.92, the minus sign indicating a greater percentage of men. The difference was not significant. Other entries were interpreted similarly.

For each semester the percentage of women was greater than that of men in the top 10 per cent group and less in the bottom 10 per cent group. The differences were not all significant, there being only three values having significance at the one per cent level and an additional one at the five per cent level, but the trend was general.

The three differences which were significant at the one per cent level were all within the bottom 10 per cent group, indicating that the difference was in favor of the men in the inferior groups.

In summary, it may be stated that there was generally a significantly greater percentage of men than of women in the inferior-achievement groups. In the superior-achievement groups, on the other hand, there was a significantly greater percentage of women than of men for only the third semester, although the percentage of women was somewhat greater for every semester.

From the data available it was impossible to make a complete explanation of the better showing of women in achievement, but a few suggestions may be advanced. It would appear that, since the placement tests showed the women to be superior in linguistic ability, vocabulary, and spelling, these areas of ability played a larger part in determining success in the college program during the first two years than did the areas of mathematics and quantitative thinking, in which the men showed superior ability.

The ratios of men to women for the first four semesters were, respectively, 1.43, 1.45, 1.58, and 1.57 to 1.00. With the exception of the last one, the ratios increased from semester to semester, particularly after the second semester. Although this study included no analysis of dropouts, it may be suggested that women whose achievement was rather low had a greater tendency to drop out of college than did the men in a similar situation. The reason might be in the fact that women depend less upon a full college education for a livelihood than do men, and thus have less motivation to continue in spite of adversities. This suggestion appears to be borne out by the fact that, although the percentage of women was significantly less in the inferior-achievement group, it was not similarly greater in the superior-achievement group. These ideas merit considerably more investigation.

## The Relation of Size of High School to Achievement

The fourth general problem was to discover the relationships which existed between the size of high school from which the exceptional

students came and achievement, as measured by the grade-point averages for four semesters.

The method employed was similar to that in the first two problems. Contingency tables were prepared to relate the coded value of high-school size to grade-point average for each semester, for both bottom and top groups in achievement. Table 10 contains the resultant contingency coefficients, Chi-square values, and degrees of freedom.

TABLE 10
*Relationships between High-School Size and Grade-Point Averages for Exceptional Students*

| GPA for Semester | Exceptional Group | C | Chi-square* | d.f. |
|---|---|---|---|---|
| 1 | Bottom 10% | .11 | 1.35 | 3 |
| 1 | Top 10% | .07 | .66 | 4 |
| 2 | Bottom 10% | .12 | 1.68 | 4 |
| 2 | Top 10% | .13 | 1.85 | 4 |
| 3 | Bottom 10% | .14 | 1.69 | 3 |
| 3 | Top 10% | .21 | 3.96 | 2 |
| 4 | Bottom 10% | .12 | 1.18 | 4 |
| 4 | Top 10% | .14 | 1.71 | 3 |

* No significant values.

There were no significant relationships revealed in any of the calculations, indicating that, so far as the present study is concerned, high-school size was not an important factor in academic achievement in college for the exceptional groups. If a correlation had been computed between size of school and academic achievement using the entire freshmen class, the results may have been different.

## A Comparison of the Variability of Exceptional-Ability Groups in Achievement

The final phase of the present investigation was for the purpose of discovering and comparing the variability in achievement, as shown by the grade-point averages for the first four semesters, of the superior-ability and inferior-ability groups, as revealed by the eight sets of placement-test scores. For this purpose frequency polygons were prepared which showed the grade-point-average distributions for the bottom and top 10 per cent groups on each set of placement-test scores for each semester. Thirty-two pairs of polygons were drawn but only eight are included in this report, namely: for A.C.E. Quantitative and A.C.E. Linguistic.

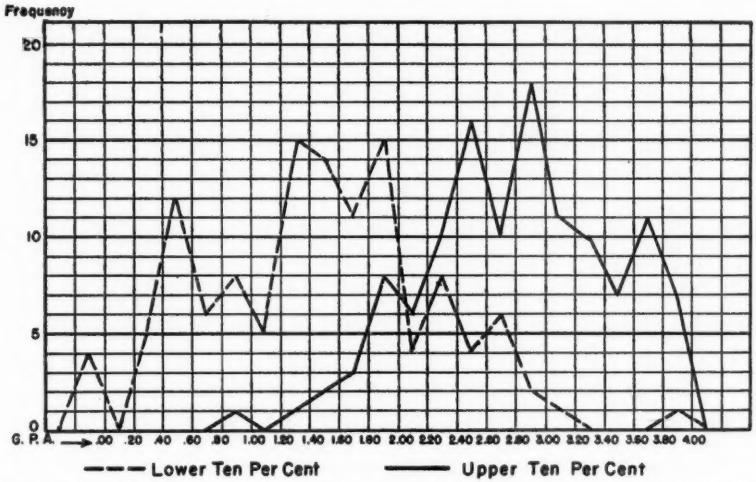



FIGURE 1—First Semester Distribution of Grade-Point Averages for Exceptional Students as Shown by A.C.E. Quantitative Scores.

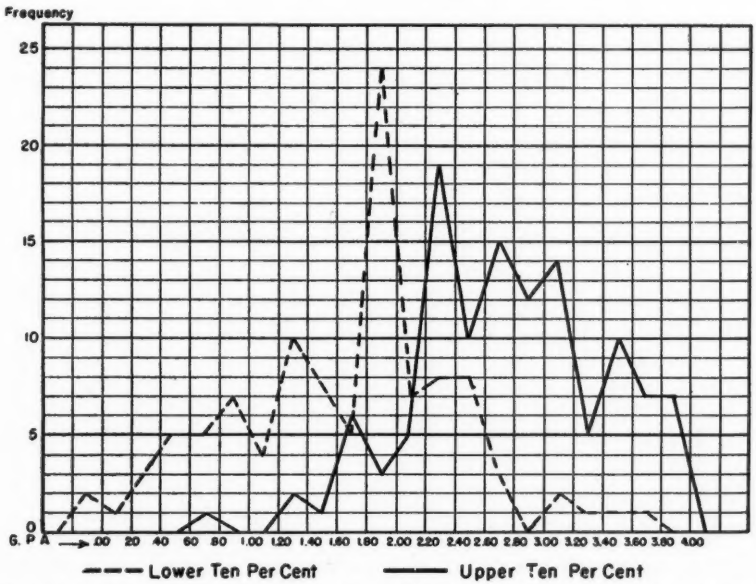



FIGURE 2—Second Semester Distribution of Grade-Point Averages for Exceptional Students as Shown by A.C.E. Quantitative Scores.

An initial study of the frequency polygons revealed the following facts:

1. The polygons roughly approximated the shape of the normal distributions; i.e., the modes were found somewhere near the centers of their respective distributions, whereas the least frequencies were found near the extremes of the distributions.

2. The distributions for the superior groups tended to be negatively skewed; i.e., the modes were generally to the right of the center of the range for their distributions. This tendency was observed for each of the four semesters. It might be expected that a counterpart positive skewness would be observed in the inferior-ability polygons, but such was not the case. No general trend was observable.

3. The frequency polygons for the inferior-ability groups lay generally to the left of those for the superior-ability groups, with some degree of overlap, showing that placement-test scores were an indication, though imperfect, of expected achievement.

4. After the first semester, for which the sizes of the exceptional-ability groups were equal, the inferior-ability polygons decreased in size more than did the superior-ability polygons, showing that the majority of drop-outs came from the inferior-ability groups.

5. As the inferior-ability polygons decreased in size, the means of the distributions generally shifted toward higher grade-point averages, indicating that the greatest frequency of drop-outs occurred among those students who had the lowest grade-point averages. This is, of course, what would normally be expected.

6. The amount of overlap of the inferior-group and superior-group polygons varied considerably among the various sets of placement-test scores. For the first semester, where comparison could most readily be made, the greatest overlap occurred in the case of the C.E.T.-Spelling groups, and the least in the case of the C.E.T.-Usage groups.

7. After the first semester the percentage of overlap between the inferior and superior groups increased, indicating that as exceptional-ability students progress through college, the placement-test scores, if used for prediction of grade-point averages, probably would be less helpful as indicators of their achievement.

8. A noticeable similarity occurred between the polygons for the A.C.E.-Quantitative and the K.U.-Mathematics scores. Although a study of the polygons themselves did not show that particular individuals tended to make comparable scores on the two tests, the study of

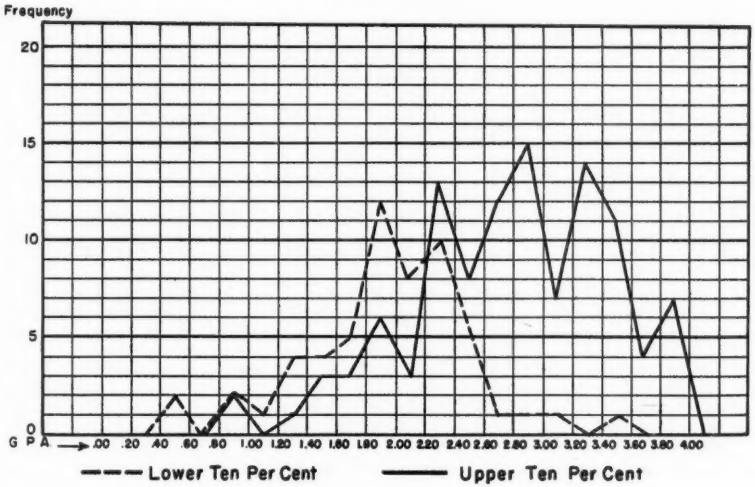



FIGURE 3—Third Semester Distribution of Grade-Point Averages for Exceptional Students as Shown by A.C.E. Quantitative Scores.

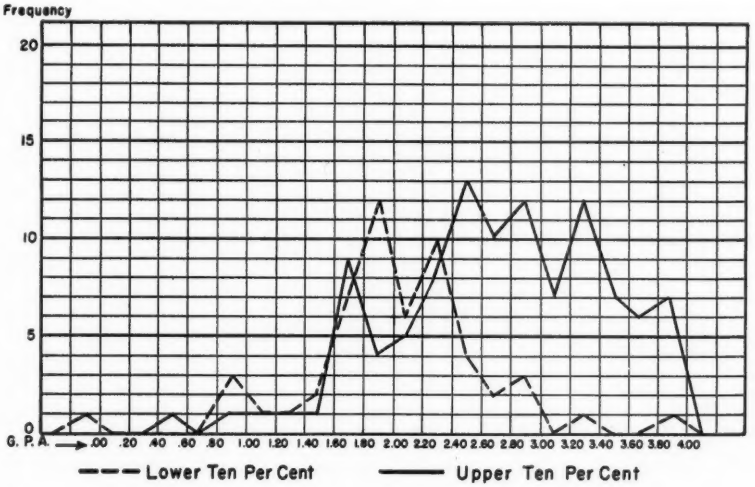



FIGURE 4—Fourth Semester Distribution of Grade-Point Averages for Exceptional Students as Shown by A.C.E. Quantitative Scores.

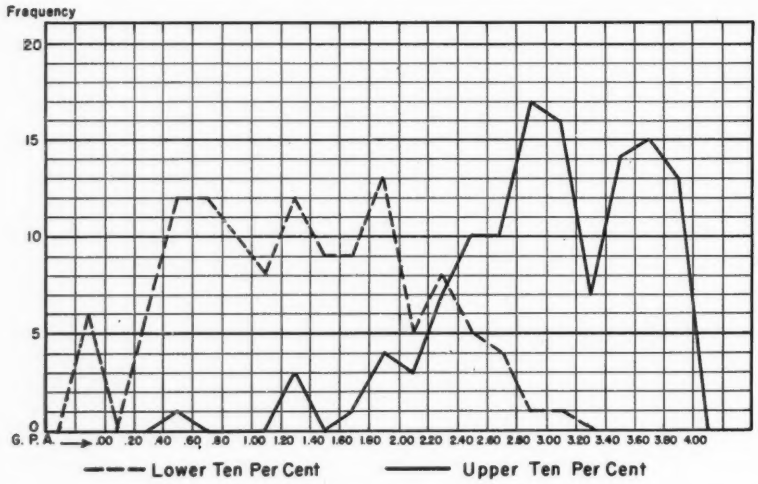



FIGURE 5—First Semester Distribution of Grade-Point Averages for Exceptional Students as Shown by A.C.E. Linguistic Scores.

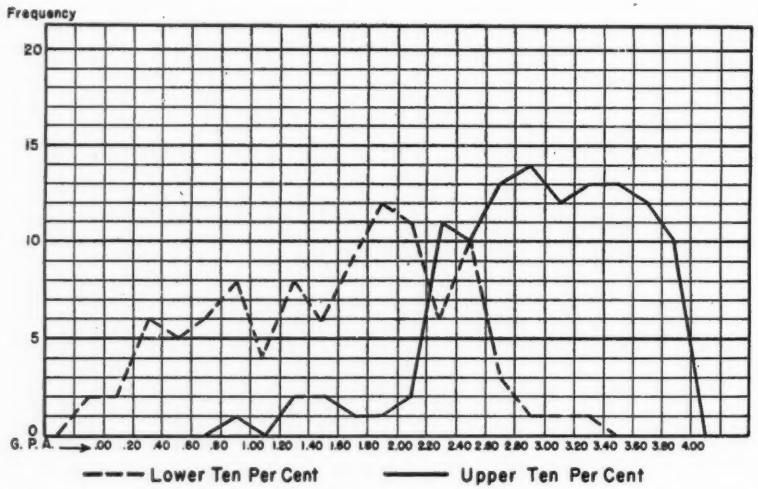



FIGURE 6—Second Semester Distribution of Grade-Point Averages for Exceptional Students as Shown by A.C.E. Linguistic Scores.

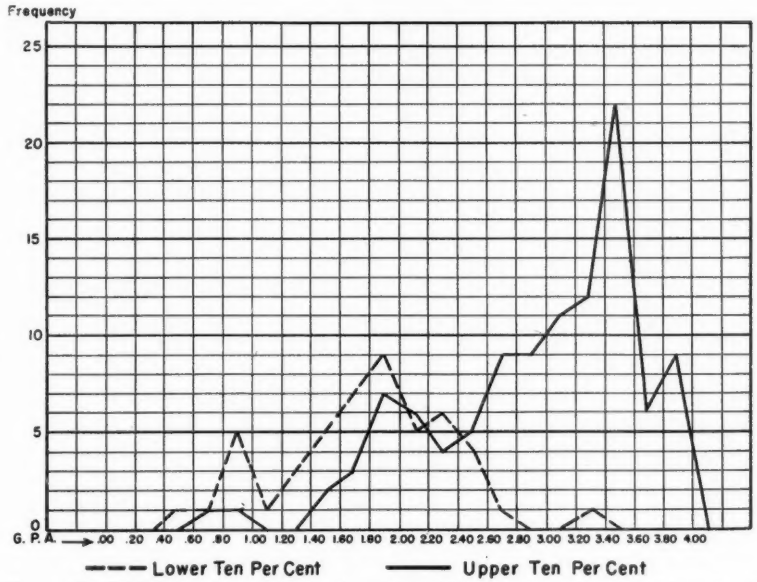



FIGURE 7—Third Semester Distribution of Grade-Point Averages for Exceptional Students as Shown by A.C.E. Linguistic Scores.

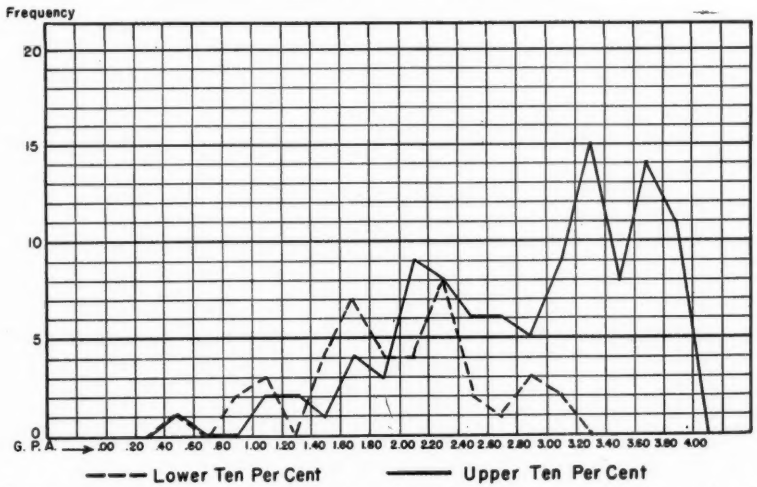



FIGURE 8—Fourth Semester Distribution of Grade-Point Averages for Exceptional Students as Shown by A.C.E. Linguistic Scores.

the score distributions did. Such a study revealed that when an individual scored in the top 10 per cent on either the A.C.E.-Quantitative or K.U.-Mathematics Test, there was a strong tendency for him to do so on the other one as well. Moreover, there was a noticeable tendency, particularly in the case of the K.U.-Mathematics Test, for him not to score in the top 10 per cent of any of the other sets of scores. The same observations were true to a lesser extent for the bottom 10 per cent groups on the same two tests.

A more detailed study of the 32 pairs of frequency polygons was made by tabulating, for each exceptional-ability group, the percentage of individuals for each semester who had grade-point averages of 1.00 or below (a grade average of D or below); 2.00 to, but not including, 1.00 (C to D); 3.00 to, but not including, 2.00 (B to C); and over 3.00 (above B). These values, for the four semesters, are presented in Tables 11 to 14. The designations "B" and "T" refer, respectively, to the bottom and top 10 per cent groups.

Table 11 is to be read as follows: for the first semester, 29.1 per cent of the 121 individuals in the inferior-ability group, as shown by the A.C.E.-Quantitative scores, received grade averages of D or below; 49.8 per cent received grade averages of D to C; 19.9 per cent, C to B; and 1.7 per cent, above B. Other values in the four tables are to be interpreted similarly.

It was evident that there was considerable variability in all of the ability sub-groups. For the first semester the percentages of those in the bottom group who received grade averages of above B ranged from zero, for the A.C.E.-Total scores, to 5.8 per cent, for the C.E.T.-Spelling scores. Conversely, the percentages of those in the top group who received grade averages of D or below ranged from zero, for the A.C.E.-Total, KU-Mathematics, and C.E.T.-Usage scores, to 1.7 per cent, for the C.R.T.-Vocabulary and C.E.T.-Spelling scores. A similar examination for the other three semesters revealed that the inferior groups, as shown by the A.C.E.-Total, C.R.T.-Speed, C.R.T.-Vocabulary, and K.U.-Mathematics scores, had the least percentages of individuals who received above B in grade averages. The converse was true for the superior groups, as shown by the A.C.E.-Total, C.R.T.-Vocabulary, and C.E.T.-Spelling scores, i.e., they had the smallest percentages of individuals who received grade averages of D or below.

To extend this analysis of variability, a ranking of the eight placement-tests was prepared in the order of the degree of overlap of the

TABLE 11
*Percentage Grade-Distributions of Exceptional-Ability Groups for the First Semester*

| Set of Scores | Group | N | Percentages | | | |
|---|---|---|---|---|---|---|
| | | | D and Below | D to C | C to B | Above B |
| A.C.E.—Q | B | 121 | 29.1 | 49.8 | 19.9 | 1.7 |
| A.C.E.—Q | T | 121 | 0.8 | 11.6 | 49.8 | 38.2 |
| A.C.E.—L | B | 121 | 38.2 | 42.3 | 19.1 | 0.8 |
| A.C.E.—L | T | 121 | 0.8 | 6.6 | 39.0 | 54.0 |
| A.C.E.—T | B | 121 | 35.7 | 48.1 | 16.6 | 0.0 |
| A.C.E.—T | T | 121 | 0.0 | 5.8 | 37.4 | 57.3 |
| K.U.—M | B | 121 | 29.9 | 50.6 | 19.1 | 0.8 |
| K.U.—M | T | 121 | 0.0 | 12.4 | 39.8 | 48.1 |
| C.R.T.—V | B | 121 | 34.0 | 40.7 | 23.2 | 2.5 |
| C.R.T.—V | T | 121 | 1.7 | 8.3 | 39.0 | 51.5 |
| C.R.T.—S | B | 121 | 39.8 | 42.3 | 16.6 | 1.7 |
| C.R.T.—S | T | 121 | 0.8 | 11.6 | 46.5 | 41.5 |
| C.E.T.—U | B | 121 | 40.7 | 46.5 | 11.6 | 1.7 |
| C.E.T.—U | T | 121 | 0.0 | 3.3 | 43.2 | 54.0 |
| C.E.T.—S | B | 121 | 23.2 | 45.7 | 25.7 | 5.8 |
| C.E.T.—S | T | 121 | 1.7 | 11.6 | 38.2 | 49.0 |

TABLE 12
*Percentage Grade-Distributions of Exceptional-Ability Groups for the Second Semester*

| Set of Scores | Group | N | Percentages | | | |
|---|---|---|---|---|---|---|
| | | | D and Below | D to C | C to B | Above B |
| A.C.E.—Q | B | 105 | 21.8 | 48.4 | 24.7 | 4.8 |
| A.C.E.—Q | T | 117 | 0.9 | 10.2 | 51.9 | 36.6 |
| A.C.E.—L | B | 101 | 28.7 | 38.6 | 30.7 | 2.0 |
| A.C.E.—L | T | 117 | 0.9 | 5.1 | 42.5 | 51.0 |
| A.C.E.—T | B | 100 | 27.0 | 48.0 | 23.0 | 2.0 |
| A.C.E.—T | T | 118 | 0.0 | 6.8 | 40.0 | 53.6 |
| K.U.—M | B | 102 | 26.5 | 46.1 | 26.5 | 1.0 |
| K.U.—M | T | 119 | 2.5 | 7.6 | 48.7 | 41.2 |
| C.R.T.—V | B | 101 | 20.8 | 41.6 | 36.6 | 1.0 |
| C.R.T.—V | T | 116 | 2.6 | 9.5 | 37.0 | 50.7 |
| C.R.T.—S | B | 100 | 22.0 | 47.0 | 29.0 | 2.0 |
| C.R.T.—S | T | 119 | 4.2 | 8.4 | 42.8 | 44.5 |
| C.E.T.—U | B | 97 | 25.8 | 51.5 | 18.5 | 4.1 |
| C.E.T.—U | T | 116 | 0.9 | 1.7 | 46.4 | 50.7 |
| C.E.T.—S | B | 104 | 14.4 | 39.4 | 40.3 | 5.8 |
| C.E.T.—S | T | 117 | 3.4 | 7.7 | 43.4 | 45.1 |

TABLE 13
*Percentage Grade-Distributions of Exceptional-Ability Groups for the Third Semester*

| Set of Scores | Group | N | Percentages | | | |
|---|---|---|---|---|---|---|
| | | | D and Below | D to C | C to B | Above B |
| A.C.E.—Q | B | 57 | 7.0 | 45.5 | 43.8 | 3.5 |
| A.C.E.—Q | T | 109 | 1.8 | 12.0 | 46.9 | 39.6 |
| A.C.E.—L | B | 49 | 14.3 | 51.0 | 32.6 | 2.0 |
| A.C.E.—L | T | 107 | 1.9 | 11.2 | 30.7 | 55.8 |
| A.C.E.—T | B | 47 | 10.7 | 51.1 | 38.3 | 0.0 |
| A.C.E.—T | T | 107 | 0.0 | 9.3 | 31.6 | 58.6 |
| K.U.—M | B | 43 | 7.0 | 39.6 | 48.9 | 4.7 |
| K.U.—M | T | 110 | 4.6 | 11.8 | 51.9 | 31.9 |
| C.R.T.—V | B | 60 | 13.4 | 33.4 | 48.4 | 5.0 |
| C.R.T.—V | T | 106 | 0.9 | 9.4 | 32.9 | 56.4 |
| C.R.T.—S | B | 57 | 12.3 | 57.8 | 29.8 | 0.0 |
| C.R.T.—S | T | 104 | 1.9 | 7.7 | 34.6 | 55.7 |
| C.E.T.—U | B | 49 | 16.2 | 49.0 | 32.6 | 2.0 |
| C.E.T.—U | T | 103 | 1.0 | 1.0 | 39.8 | 58.2 |
| C.E.T.—S | B | 70 | 11.4 | 38.6 | 45.8 | 4.3 |
| C.E.T.—S | T | 97 | 1.0 | 6.2 | 33.0 | 59.7 |

TABLE 14
*Percentage Grade-Distributions of Exceptional-Ability Groups for the Fourth Semester*

| Set of Scores | Group | N | Percentages | | | |
|---|---|---|---|---|---|---|
| | | | D and Below | D to C | C to B | Above B |
| A.C.E.—Q | B | 54 | 7.4 | 42.6 | 46.3 | 3.7 |
| A.C.E.—Q | T | 105 | 1.9 | 15.2 | 45.6 | 37.1 |
| A.C.E.—L | B | 41 | 7.3 | 43.9 | 43.9 | 4.9 |
| A.C.E.—L | T | 104 | 1.0 | 11.5 | 32.6 | 54.7 |
| A.C.E.—T | B | 44 | 11.4 | 47.7 | 38.6 | 2.3 |
| A.C.E.—T | T | 107 | 0.9 | 9.3 | 32.6 | 56.7 |
| K.U.—M | B | 40 | 5.0 | 32.5 | 60.0 | 2.5 |
| K.U.—M | T | 108 | 0.9 | 19.5 | 45.6 | 34.4 |
| C.R.T.—V | B | 53 | 5.7 | 30.2 | 58.6 | 5.7 |
| C.R.T.—V | T | 102 | 0.0 | 9.8 | 35.3 | 54.9 |
| C.R.T.—S | B | 52 | 9.6 | 49.9 | 40.3 | 0.0 |
| C.R.T.—S | T | 98 | 0.0 | 8.2 | 33.7 | 58.1 |
| C.E.T.—U | B | 44 | 18.2 | 38.6 | 38.6 | 4.5 |
| C.E.T.—U | T | 100 | 1.0 | 7.0 | 38.0 | 54.0 |
| C.E.T.—S | B | 64 | 4.7 | 35.9 | 51.5 | 7.8 |
| C.E.T.—S | T | 93 | 0.0 | 8.6 | 37.8 | 54.0 |

two exceptional groups in grade-point averages. Referring to the 32 frequency polygons, the degree of overlap was a rough measure of the area which was common to both frequency polygons. The quantities which were ranked were found by adding the total percentage of individuals from the top group who fell to C or below in grade average to the percentage of individuals from the bottom group who were above C. Table 15 contains the rankings for each semester, with the one having the smallest measure of overlap at the top. Those at the top probably would be the most consistent indicators of grade-point averages for exceptional students if prediction of success in these terms were the purpose.

It may be seen from Table 15 that C.E.T.-Usage and A.C.E.-Total ranked near the top, whereas C.R.T.-Vocabulary, C.E.T.-Spelling and K.U.-Mathematics ranked near the bottom.

TABLE 15

*Rankings of Placement Tests in Order of Increasing Overlap of Exceptional Groups in Terms of Grade-Point Averages*

| Rank | Semester | | | |
|---|---|---|---|---|
| | First | Second | Third | Fourth |
| 1 | C.E.T.—U | C.E.T.—U | C.E.T.—U | C.R.T.—S |
| 2 | A.C.E.—T | A.C.E.—T | C.R.T.—S | C.E.T.—U |
| 3 | A.C.E.—L | K.U.—M | A.C.E.—T | A.C.E.—T |
| 4 | C.R.T.—S | A.C.E.—L | A.C.E.—L | A.C.E.—L |
| 5 | K.U.—M | A.C.E.—Q | C.E.T.—S | A.C.E.—Q |
| 6 | A.C.E.—Q | C.R.T.—S | A.C.E.—Q | C.E.T.—S |
| 7 | C.R.T.—V | C.R.T.—V | C.R.T.—V | C.R.T.—V |
| 8 | C.E.T.—S | C.E.T.—S | K.U.—M | K.U.—M |

A comparison was made of the variances of the exceptional groups in grade distributions. For the first semester, where comparison was easy because of equal numbers in all sub-groups, the variances were uniformly greater for the inferior ability groups. After the first semester, comparison was more difficult because the numbers were different in the sub-groups. In most cases tested, variances were still greater for the inferior-ability groups, whereas for some others they were greater for the superior-ability groups. It may be concluded, therefore, that the variability of the inferior-ability groups in terms of grade-point averages was greater than that of the superior-ability groups for the first

semester. Thereafter, there is no clear distinction apparent, although there still appeared to be slightly greater variability among the inferior-ability groups.

## PART IV

### Summary of the Findings

The findings of the present study, reached through application of the appropriate statistical techniques, may be summarized as follows:

1. The relationships between ability, in terms of placement-test scores, and achievement, in terms of grade-point averages, (a) decreased from one semester to the next, (b) were more significant for the top 10 per cent groups in ability than for the bottom ones, and (c) were significant for only certain tests which involve the use of language, and for neither of the tests which involve the use of mathematics.

2. The four sets of placement-test scores which were significantly related to achievement were, in order of frequency of significant relationships, *A.C.E. Psychological Examination,* Linguistic score; *A.C.E. Psychological Examination,* Total score; *Cooperative English Test,* Usage score; and *Cooperative Reading Test,* Vocabulary score.

3. The only significant relationships between the level of parental education and college achievement involved the educational levels of the fathers; none involved the mothers' educational levels.

4. There were significant relationships between the level of the fathers' education and college achievement for both exceptional groups for the first two semesters, but none thereafter. This was shown to be a true decrease in relationship and not merely a statistical result of decreasing variability among students due to drop-outs among low-achievement individuals.

5. There appeared to be no special advantage in favor of either high or low exceptional groups with respect to the relationships between level of parental education and achievement in college.

6. Women students manifested significantly greater ability than the men in English usage and spelling and, to a smaller degree, in linguistic use and vocabulary. Men students showed significantly greater ability in mathematics and quantitative thinking.

7. The percentage of women in the low-achievement groups was less than that of men for every semester, the difference being highly significant for each semester after the first.

8. The percentage of women in the high-achievement groups was greater than that of men for every semester, although the difference was significant for only the third semester.

9. There was no significant relationship between high-school size and college achievement for the exceptional groups.

10. As exceptional-ability students progressed through the first four semesters of college the amount of overlap in academic achievement, between the low and top groups in ability as measured by the placement-tests, increased.

11. The C.E.T.-Usage and A.C.E.-Total score distributions were the least variable in terms of grade-point averages, whereas the C.R.T.-Vocabulary, C.E.T.-Spelling, and K.U.-Mathematics score distributions were the most variable.

12. For the first semester, the variability in grade-point averages was greater among the low-ability than among the high-ability groups in all eight sets of distributions. After the first semester, due to the greater number of drop-outs from the low-ability groups, no such clear distinction was evident, although in the majority of cases tested, considering the number of students involved, the variability was still slightly greater for the low-ability groups.

13. There was greater similarity between the A.C.E.-Quantitative Test and the K.U.-Mathematics Test than between any other two tests in their measurement of ability. There was considerable similarity, also, in the grade-point distributions of the exceptional groups for both tests.

## PART V

### Educational Implications of the Study

The general problem of increasing enrollments which confronts American colleges and universities has already been presented. More specifically, the difficulty of giving adequate consideration to exceptional students as congestion increases has also been suggested. The purpose of the present study was stated in terms of five problems, all of which concerned the relationships between certain variable factors attainable near the time of a student's enrollment in college, and achievement in terms of grade-point averages. The findings derived from a statistical investigation of the problems were set forth in Part IV. It is now appropriate that some consideration be given to the implications which the findings have for the University of Kansas, and perhaps

for other colleges and universities as well, since the problems considered are shared quite generally by higher institutions of learning.

## Difficulties in Accurate Prediction

A most obvious implication is that an accurate prediction of achievement in terms of grade-point averages would be difficult for exceptional students. The present study was not predictive, but the general lack of high relationships means that prediction would be far from perfect. This has no reference to whether or not it would be possible to predict that an individual would fall within an exceptional-achievement group, but rather to the prediction of an exact grade-point average, once it is decided that the individual is exceptional. The former is an interesting and worth-while consideration, but it was beyond the scope of the present investigation.

There are two factors which stand out as probable causes of lack of relationship between measures of ability and achievement: (a) inaccuracies in measurement, and (b) variations in motivation. In the analysis of 32 frequency polygons, it was stated that, especially for the first semester, and somewhat thereafter, the low-ability groups were more variable in achievement than were the high-ability groups. It is probable that much of the explanation of this fact lies in peculiarities of the instruments by means of which ability was measured, rather than in characteristics of ability itself. It is more common for exceptionally able individuals to be ranked deficient by some test of ability than it is for the exceptionally low in ability to be ranked high. With reference to the group which formed the basis for this study, it was very probable that a number of those who were classified as being exceptionally low in ability were, in reality, near average or even above. The grade-point averages of such individuals would be expected to disclose the inaccuracies in the initial ability-measurements. The greater variability of grade-point averages within the low-ability groups, which manifested itself primarily by a progressive rising of the upper limit of the grade-point range, was an indication that such an expectation was fulfilled in this particular case. Such inaccuracies in measurement of ability, as well as the ever-present inaccuracies in grading, make precise prediction of grade-point averages difficult.

Numerous writers have pointed out the great importance of motivation as a factor in successful achievement. The Educational Policies Commission has stated:

> Lack of interest in schooling or motivation toward continued work in college is perhaps the most pervasive barrier to the full education of all young people of college caliber. Some home environments discourage able students from college work; in some communities or groups the prevailing mores are anti-educational. Motivation is one of the salient requisites for success in higher education; where motivation is not developed latent ability is too frequently not educated. With motive and drive many other handicaps can be overcome.[18]

Although motivation is of such prime importance, it is very difficult to measure. In the present study there was no instrument employed for such estimation. It is probable that until some suitable method is devised, predictions of achievement will be markedly lacking in accuracy.

### Better Guidance for Superior Students

A second implication of the study is that more accurate guidance can be provided for the high-ability than for the low-ability groups. This statement is based upon two facts: (a) there were considerably more significant relationships between measures of ability and of achievement for the high-ability than for the low-ability groups, and (b) the variability in achievement was generally less for the high-ability groups. Considering these facts, it is probable that if relationships were calculated between measures of ability and achievement within the various schools of the University, reasonably accurate estimates of success in achievement could be developed for the exceptionally able student, once it was decided which school he wished to enter.

If accurate predictions of success for superior students were to be made, it would be possible to employ various devices to relieve the congestion and overloading of college and university facilities. The Pressey[19] study suggested two such possibilities that were examined at Ohio State University: (a) acceleration of the exceptionally able; and (b) reduction of class time for the most able, allowing them to do more of their work outside of class and in special conferences and seminars.

### Scarcity of Inferior Students

A third implication of the study is that the college student who may be treated as generally inferior is a rare individual. Relative to the

[18] Educational Policies Commission. *Higher Education in a Decade of Decision*. National Education Association, Washington, D.C., 1957, pp. 27-28.

[19] Sidney L. Presesy. "Educational Acceleration." *Educational Research Bulletin,* 23 (October, 1944), pp. 188-190; 24 (November, 1945), pp. 216-217, 221; 25 (November, 1946), pp. 217-218; 26 (November, 1947), pp. 219-220.

entire student group, of course, a certain number of individuals are of necessity considered inferior. Relative to the entire population, however, the majority of college students are probably above average in ability.

In the present study there were only six individuals out of the entire group of 1210 who were in the bottom 10 per cent of all eight sets of scores. On the other hand, there were 135 who were in the bottom 10 per cent of only one set of scores. Some 10 individuals who were in the bottom 10 per cent of at least one set of placement-test scores, were in the top 10 per cent of from one to four distributions of grade-point averages. Even more individuals were in the bottom 10 per cent of one or more sets of placement-test scores and, at the same time, in the top 10 per cent of from one to four other sets of scores. Certainly none of these individuals should be classed as "inferior" in any general sense, unless it could be those who were consistently in the bottom 10 per cent groups. Almost every student in such a situation should be able to find some area of study where satisfactory progress could be maintained.

It was observed in Part III that the students who were lowest in achievement tended to drop out of their own accord after a few semesters. Although it might be considered advantageous to keep these students from entering in the first place, it appears quite certain that, with the possible exception of a few of the very lowest in ability, there is possibility of their succeeding in a well-chosen college program. Those who desire the opportunity should be allowed it.

Rather than to institute a policy of general rejection of students who fall into certain bottom 10 per cent groups in ability, it would appear wiser to give the best possible counseling to such individuals, indicating the statistical possibility of their becoming drop-outs due to low achievement, emphasizing the importance of strong motivation, and leaving the decision to the individual under consideration. Probably it would be well to leave him on probation for a semester or a year, with special attention and counsel available to him whenever it became necessary. Such a policy is certainly in accord with the prevailing idea of full opportunity for all who desire it.

## Sex Differences

It was discovered in the statistical analysis of the data, as reported in Part III, that there were significantly fewer women than men, by percentage, in the low-achievement groups. There were also more

women then men, by percentage, in the high-achievement groups, although the significance of the difference was not so great as in the low-ability groups. It was discovered, moreover, that women students dropped out in greater percentages than did the men, for every semester except the last, when the percentages were almost equal.

From the foregoing facts it is quite evident that the motivation of women to continue their college career was less than that of the men to do so. In the administration of any selective admissions policy which might be necessitated through rapid increase in enrollments, motivation would certainly be a factor requiring serious consideration. The findings of this study indicate that motivation may be assumed to be somewhat greater among men than among women. There should be developed ways of stimulating stronger motivation of able women students to continue to the completion of a college program. This area of study merits considerably more research, as it is impossible to generalize accurately from one group of limited size.

## Scarcity of General Ability

It was stated earlier that the present study has revealed very little of what may be considered general inferiority in ability. The counterpart statement may also be made: there has been disclosed very little general superiority in ability. Out of 1210 individuals studied, only two were in the top 10 per cent of all eight sets of placement-test scores. A considerable number of students who were in the top 10 per cent of one or more sets of placement-test scores were in the bottom 10 per cent of other score distributions, and in the bottom 10 per cent of the average-grade-point distributions for one or more semesters.

The implication of these facts for education is that there is much more need for considering exceptionality in specific abilities than in general ability. As Stoke has remarked, "No school dare classify its students (or would really find it feasible to do so) on the basis of general ability."[20] This is not to say that there are no students who should be considered either generally superior or inferior, but that the specifically able or less able individuals are greatly in the majority. For college or university planning, this means that the major problem in dealing with the exceptional-ability students is to locate specific abilities and to guide the students into courses and curricula suited to their particular

[20] Harold W. Stoke. "Some Observations on the Education of Gifted Students." *The Educational Record,* 38 (April, 1957), 133.

abilities. The primary issue from a philosophical and psychological standpoint then becomes, not what means to employ in the elimination of the less able, but rather, what means to employ in the discovery and development of the single, specific ability of an individual who desires to exploit his opportunities.

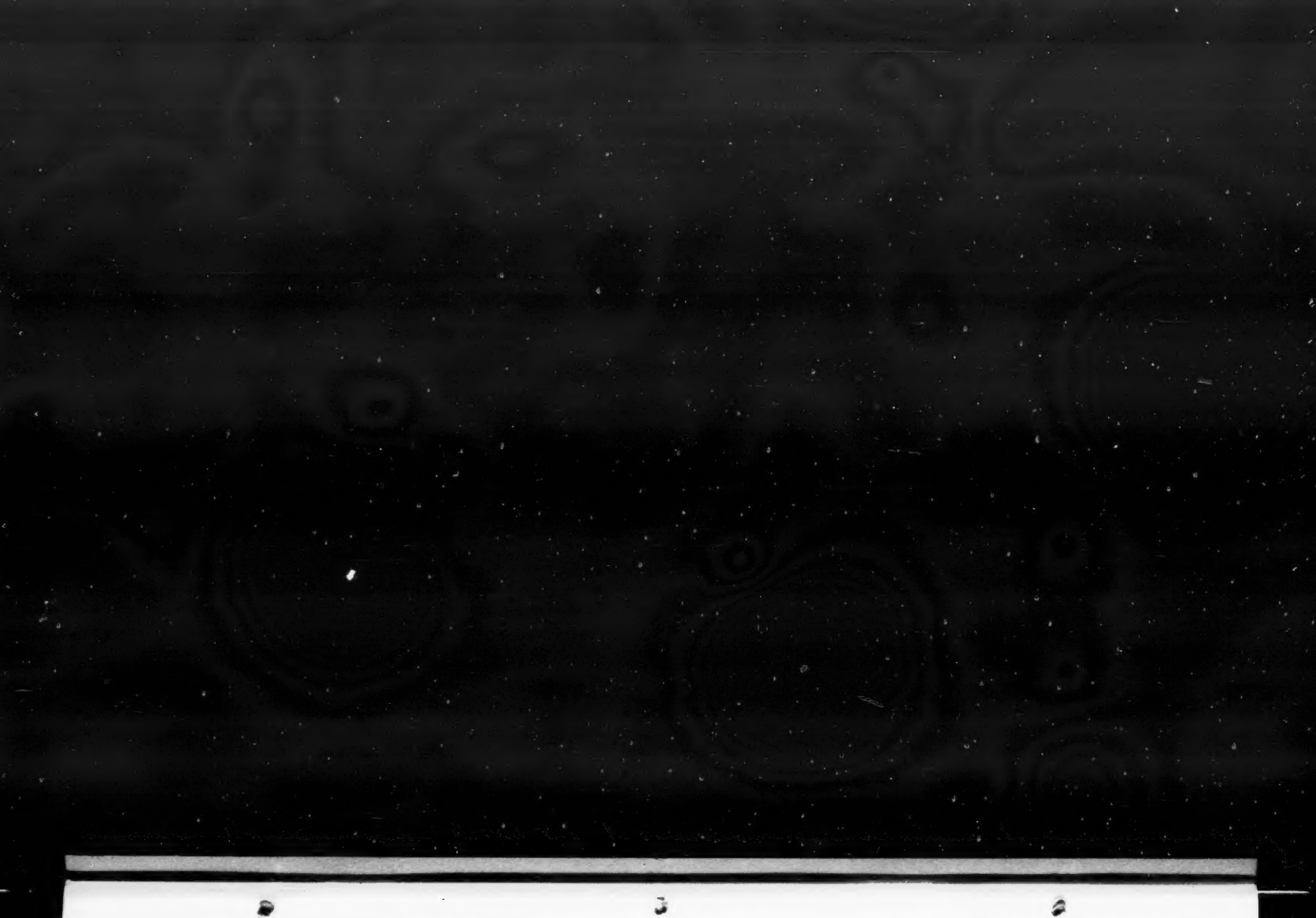
## Evaluation of the Placement-Examination Battery

A final implication concerns the necessity of evaluating the placement-test battery in the light of the needs of exceptional students for expert guidance. There is probably no denying the value of the battery in terms of placement purposes when used with the entire freshman class. However, the findings of the present study indicate that some of the tests probably would add little to the predictive value of the battery if the purpose were to predict academic achievement in terms of grade-point averages for exceptional students. If predictions of achievement were to be made separately within the various schools of the University, as suggested earlier, some of the tests would undoubtedly have greater validity than they would when used in predicting general achievement.

It would be well for a study to be made of the placement-examination battery to discover over-laps which, as has been indicated in the present investigation, exist to a considerable extent. Tests which add very little to the value of the battery might well be replaced with other tests more pertinent to the problem at hand. For some purposes the tests in the present battery are suitable and for other purposes they are not. In addition to the tests used in the battery and described in this study, other examinations are given with different purposes in mind, such as chemistry, biology, German, French, Spanish, Latin, and music theory.

## Conclusion

The foregoing implications should be taken rather as suggestions than as final recommendations. Inferences from a study of such limited scope are at best only tentative. This has been only one phase of a more comprehensive investigation conducted at the University of Kansas. When the general project is completed, with this contribution as one component part, the findings and implications contained herein should be considerably strengthened or weakened, depending upon whether or not they are in harmony with the findings of the entire investigation.



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